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Nigel Tones

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MARKETS AND THE ALTRUISTIC MOTIVE  
FOR BEQUESTS

by  
Nigel Tones

Department of Economics Library

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University of Western Ontario



**DEPARTMENT OF ECONOMICS**  
**THE UNIVERSITY OF WESTERN ONTARIO**  
**LONDON      CANADA**

UNCERTAIN LIFETIMES, IMPERFECT CAPITAL MARKETS  
AND THE ALTRUISTIC MOTIVE FOR BEQUESTS

Nigel Tones  
Department of Economics  
The University of Western Ontario  
London Ontario

October, 1979

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## ABSTRACT

In a recent article Flemming concluded that an altruistic bequest motive will be inoperative, except for families in the upper tail of the wealth distribution. Under certainty, due to economic growth and imperfect intergenerational mobility, this conclusion appears justified. However once uncertain lifetimes and imperfect annuity markets are introduced, an altruistic bequest motive is shown to be operative over the entire wealth distribution. Empirical results offer support for the existence of an operative altruistic bequest motive in a sample of small wealth holders.

## I. Introduction

In a recent issue of this Journal [Economica November 1979] several papers were devoted to analyzing the role of inherited material wealth in the generation of inequality. In particular Flemming (1979) examined the impact of earnings inequality, imperfect capital markets and dynastic altruism on the distribution of wealth and consumption. Based upon a series of 'mechanical' models (p. 3), Flemming concludes that in the presence of uncertain mortality and imperfect annuity markets, the altruistic bequest motive is unlikely to influence the wealth distribution except in the extreme upper tail:

"Plausible real wage growth rates would prevent...dynastic altruism coming into play if parents were concerned solely with their children's consumption level, except under fairly rapid skill regression, in which case it would be confined...to...the top 2 1/2% of the earnings distribution" (p. 26)

In the absence of regression to the mean across the generations

"manifestations of altruism would be completely eliminated by growth in excess of 40% per generation (1.21% p.a over our 30 year generations) so that the distribution of wealth reverts to that of the last section [i.e., prior to the introduction of altruism]" (p. 19)

This paper employs models of utility maximizing behavior to demonstrate that Flemming's conclusion concerning the unimportance of altruism is incorrect. In the presence of uncertain lifetimes and imperfect capital markets (as assumed by Flemming) the introduction of altruism is shown to influence the entire wealth distribution, even with high rates of growth and little regression to the mean--contrary to Flemming's conclusion. Once uncertainty and imperfect annuity markets are introduced, the importance of the altruistic motive for bequests cannot be ruled out on purely a priori grounds and can only be established empirically. Predictions are derived in this paper which allow empirical tests for the presence of the altruism motive to be performed. Results of these tests are reported.

The plan of the remainder of this paper is as follows: Section II examines the incidence of altruistically motivated bequests under certainty--i.e., when the length of life is certain or equivalently when perfect annuity markets allow individuals to avoid the contingencies of uncertain mortality. Under these circumstances Flemming's result is shown to be correct--that is, the altruism motive for bequests is expected to influence only the upper tail of the wealth distribution. Section III presents a model of life-cycle consumption and bequests when the length of life is uncertain and annuity markets are imperfect. Predictions are derived concerning the response of consumption, saving and bequests to changes in the incomes of the donor and heir. It is shown that, contrary to Flemming, the result of the previous section concerning the unimportance of altruism, does not extend to the uncertainty case. Section IV briefly analyzes the effects of inheritance taxes within the context of the model developed in the previous section. Section V reports empirical results which are consistent with the existence of an operative altruistic motive for bequests among families below the upper tail of the income distribution. The results of the paper are summarized in Section VI.

## II. Altruism as a Motive For Bequests: The Certainty Case

Recent theoretical models of intergenerational transfer behavior by Becker (1974), Ishikawa (1975), Becker and Tomes (1979) and others, have emphasized parental altruism as a determinant of parental expenditures on the human capital of children and bequests (or gifts) of material wealth, and thus ultimately on intergenerational mobility and the distributions of income and wealth. The altruism model has also served as a guide for recent empirical studies of the inheritance of material wealth by Adams (1976, 1978),

Menchik (1979) and others. However, it has recently been argued by Drazen (1978) and Flemming (1979) that the altruistic motive for bequeathing material wealth is likely to be inoperative for all but a minority of households. This point can be easily demonstrated for a simple case, when lifetimes are certain.

In a representative family dynasty which lasts for two generations, assume the parent-donor maximizes the "iso-elastic" utility function defined over the present value of his own lifetime consumption ( $c_d$ ) and the per capita present value of his heirs consumption at their economic birth ( $c_h$ ):

$$U_d = \frac{c_d^{1-\beta}}{1-\beta} + \frac{\lambda[(1+n)c_h]^{1-\beta}}{(1-\beta)(1+\delta)} \quad \lambda, \beta > 0, \delta \geq 0 \quad (1)$$

where  $\delta$  is the pure rate of time preference.  $\lambda = (1+\lambda)^{-1}$  is the weight attached to the heirs consumption in the donor's utility function,  $\lambda = 1$  represents 'perfect altruism' and  $\lambda = 0$  perfect egoism. The consumption of future generations is discounted for two reasons, first because it occurs later in time and second because consumption by one's heirs is 'not the same' as own consumption.  $n$  represents the rate of population growth in the family. The constraints on the two generations are given by:

$$w_d = c_d + \frac{(1+n)b}{1+r} \quad (2)$$

and  $c_h = \hat{w}_h + b$

where  $r$  is the interest rate,  $w_d$  is the wealth of the donor and  $\hat{w}_h$  is the per capita wealth of heirs in the absence of parental bequests to heirs. The bequest to each heir has a present value of  $\$b$  at the child's economic birth, say age 18. The per capita bequest is constrained to be non-negative. Given exogenous growth at the rate  $g$ , the wealth of the two generations will

bear the relationship  $\hat{w}_h = (1+g)w_d$ . In the context of this simple model all households will be at a corner solution making no altruistic bequests if  $\beta(g+n) \geq r - (\delta + \hat{\lambda})$ --that is, if the growth rate of total family wealth exceeds the desired growth rate of family consumption. Thus if the rate of interest equals the total discount factor  $(\delta + \hat{\lambda})$  either income growth or population growth will render the altruistic motive for bequests inoperative. The reason is straightforward--under these circumstances, growth raises the wealth of heirs relative to the donor's wealth, by more than the desired rate of growth of family consumption that is optimal from the donor's view point. If  $\delta + \hat{\lambda} \geq r$ , the donor will only bequeath wealth if the total wealth of heirs is less than his own wealth, however positive growth rates imply that the wealth of heirs will be higher--hence altruistic bequests will not be observed.

In addition to increasing real per capita wealth, growth may also influence consumption opportunities directly. The introduction of new products may result in future generations obtaining greater utility from a given amount of consumption, as compared to their predecessors, as they take advantage of previously unavailable consumption possibilities. The secular increase in education and health (e.g., longevity) may have similar effects. Along these lines, Michael (1973) has argued that increased education, in addition to raising market wages, also increases the productivity of individuals in the "non-market (home) production" of utility-yielding commodities.<sup>1</sup> If  $\mu$  is the rate of growth of these direct consumption benefits ("home productivity"), the condition for zero altruistic bequests becomes:  $\beta(g+n) \geq r - (\delta + \hat{\lambda}) + (1-\beta)\mu$ . The effect of growth in home productivity on the incidence of altruistic bequests depends on the parameter  $\beta$ . The reason is illustrated in Figure 1. The growth of home productivity increases



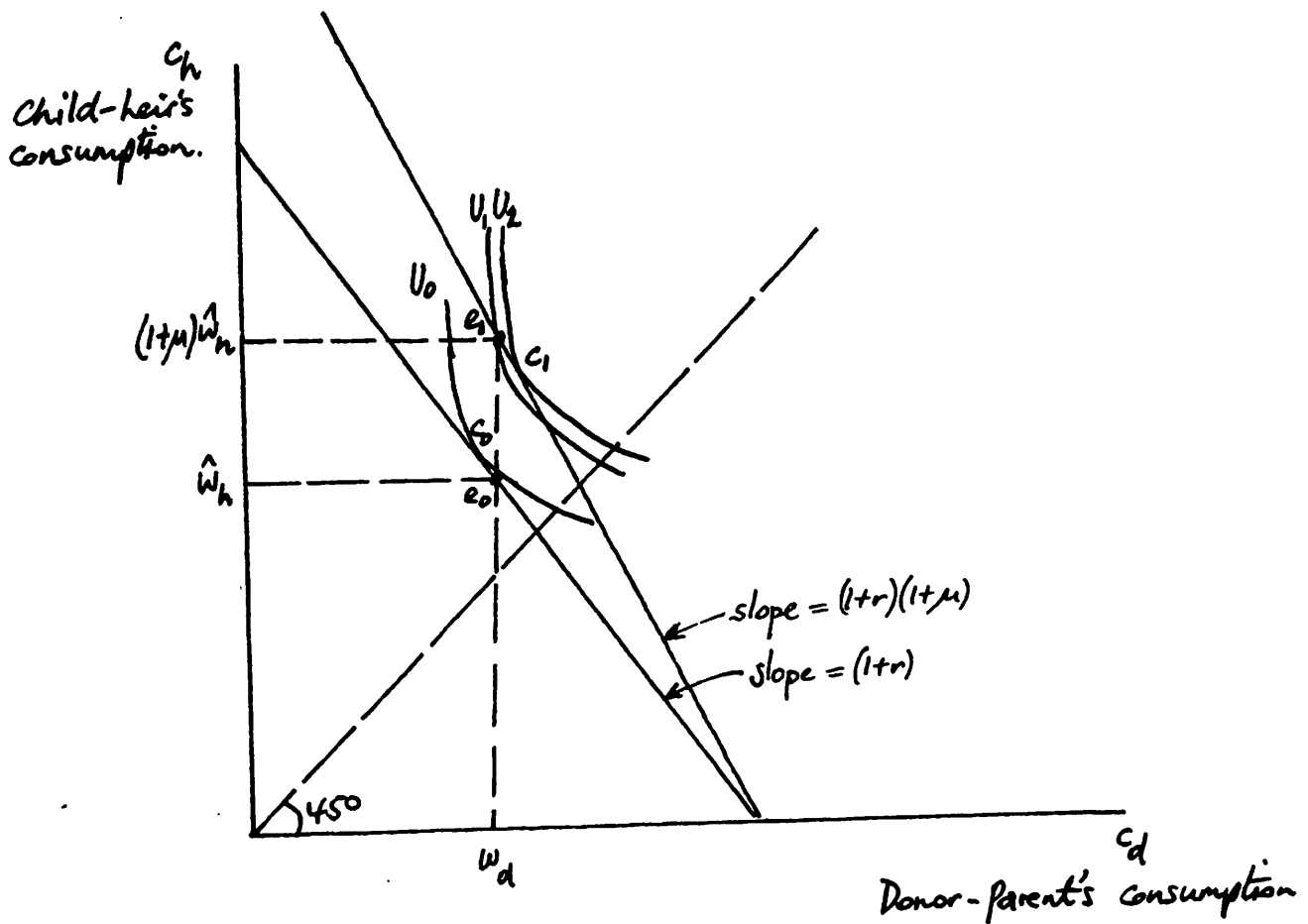


FIGURE 1: The Effect of the Growth in Home-Productivity on Altruistic Bequests.

the consumption of the next generation, that is attainable with a given amount of wealth (from  $e_0$  to  $e_1$ ) which produces a wealth effect reducing the incidence of bequests. On the other hand, the return to saving is increased (from  $(1+r)$  to  $(1+r)(1+\mu)$ ), since \$1 of wealth buys a greater quantity of utility-yielding commodities in future generations--which leads to substitution in favour of heirs. If the elasticity of substitution between the consumption of the two generations ( $1/\beta$ ) is less than unity (i.e.,  $\beta > 1$ ) the wealth effect dominates and the growth of home productivity reduces the incidence of altruistic bequests.

This case is illustrated in Figure 1. In the absence of growth in home productivity, the parent makes a positive bequest to achieve  $c_0$  from the initial endowment point  $e_0$ . In the presence of the additional direct consumption benefits of growth, the parent-donor would like to make a negative bequest to achieve point  $c_1$ , but is constrained to consume at the new endowment point  $e_1$ . In this instance ( $\beta > 1$ ) the incidence of altruistic bequests is reduced. The converse is true if the elasticity of substitution between the consumption of the two generations exceeds unity (i.e.,  $\beta < 1$ ).

The foregoing assumes that families are homogeneous and children fully inherit the economic status of their parents. More generally one can consider the case in which a distribution of wealth exists and there is regression towards the mean across the generations i.e., for the  $j^{\text{th}}$  family:

$$\hat{w}_{hj} - \bar{w} = h(w_{dj} - \bar{w}) + g\bar{w} + v_{hj} \quad 0 \leq h \leq 1 \quad j = 1, \dots, J \quad (3)$$

where  $h$  measures the inheritability of wealth,  $\bar{w}$  represents the mean wealth in the parent's generation and  $v_{hj}$  measures the child's luck in the market for wealth. (For simplicity I neglect the role of luck in what follows).

If  $\gamma_j = (w_{dj} - \bar{w}) / \bar{w}$  measures the  $j^{\text{th}}$  parent's wealth relative to the mean, the rate of growth of per capita wealth for a particular family, across the generations is:  $g_{fj} = g - \gamma_j(1-h)$ . This growth rate differs between families, depending on their position relative to the mean. For households above the mean ( $\gamma_j > 0$ ) the effects of growth and regression towards the mean operate in opposing directions. Families in the upper tail of the wealth distribution may therefore experience a rate of growth of per capita wealth less than the desired rate of growth of consumption, leading to positive bequests. The condition for the altruistic motive for bequests to be operative (i.e.,  $b_j > 0$ ) becomes:

$$\gamma_j > \frac{\beta(g+\mu+n) - [(r+\mu) - (\delta+\hat{\lambda})]}{\beta(1-h)} \quad (4)$$

If all households are homogenous (i.e.,  $\gamma_j=0$  all  $j$ ) or parental economic status is fully inherited (i.e.,  $h=1$ ), this reduces to the previous condition. At the opposite extreme with complete regression to the mean (and if  $\mu=0$ ), altruistic bequests will be positive if  $\beta(\gamma_j - g - n) > (\delta + \hat{\lambda} - r)$ . That is, if parent's wealth is sufficiently high relative to the mean to offset the effects growth and the discount factor net of the rate of interest--then altruistic bequests will be positive. For example<sup>2</sup> if  $g=2\%$  pa.,  $\delta=3\%$  pa.,  $r=4\%$  pa.,  $\hat{\lambda}=.33$ ,  $n=0$  (ZPG), and  $\beta=2$  and if the interval between generations was 25 years, the altruistic bequest motive would be operative for parents with wealth in excess of 1.42 times the mean. If lifetime wealth is crudely approximated by the observed distribution of wealth in the UK in 1975 (RCDIW 1977 Series B p. 69-71) this would correspond to 20% of families.

The existence of income immobility ( $h > 0$ ) sharply reduces the importance of altruistic bequests. For example, if  $h = 0.5$  and given the previous values of the other parameters, altruistic bequests would be made by parents with wealth in excess of 2.03 times the mean or 14% of families. Given the assumption that  $\beta > 1$ , growth in home productivity further reduces the expected incidence of altruistic bequests. For example if market and home productivity were growing at equal rates ( $g=\mu=2\%$  pa.) altruistic bequests would occur in only 10% of households. The introduction of population growth ( $n > 0$ ) would only serve to further reduce this figure.

These illustrative calculations suggest that the scope of the altruism model in explaining the distribution and intergenerational transmission of wealth is severely limited. This result is duplicated in the simulation study by Bevan (1979). Bevan, who explicitly assumes perfect insurance markets (p.5), in his "benchmark" case reflecting the most plausible

parameter values (Table 4, row 11, p. 12) finds only 10.9% of households are predicted to make positive bequests. Based upon a similar analysis (except in his treatment of uncertainty and imperfect capital markets) Flemming concluded that an operative altruistic motive for bequests is likely to be confined to the top 2 1/2% of the income distribution (p.27) and therefore in order to explain the distribution of wealth among the bulk of the population, attention should be directed to other factors such as life-cycle saving, earnings differentials and capital market imperfections (p. 4). However, this conclusion is premature, since it is shown in the next section that in the presence of imperfect capital markets and uncertain lifetimes, altruism may exert an important influence on life-cycle savings, bequests and the distribution of wealth, even when the condition for positive altruistic bequests (equation (4) above) is not fulfilled.

### III. Altruism and Inheritance Under Uncertainty

If there exists uncertainty concerning the length of life, egoistic individuals will desire to allocate their wealth entirely to life-time consumption, while avoiding depleting wealth to zero prior to death. Although annuities and pensions are attractive instruments for avoiding this latter contingency, the existence of adverse selection implies that annuities will not be available to all at actuarially fair prices. The capital market for annuities will therefore be imperfect (Stiglitz 1978b). For the remainder of this paper I shall assume that this imperfection takes an extreme form-- that is, the complete absence of annuities or pensions. In this context, consider the following model.

Each individual is assumed to live for two periods. During the first (working) period, survival is certain and the individual receives income, determined by his (given) ability. During the second period (retirement) mortality is uncertain. The individual faces a probability:  $p$  of surviving to consume during the retirement period, at the end of which mortality is

certain. On the other hand, there is a probability  $1-p$  of decease at the date of retirement. In the second period the individual receives no wage income and consumption must be financed out of accumulated wealth and interest income. The institution of the family is assumed to take the simple form of one parent and one child. Generations of the family are overlapping, so that the child's working period coincides with the parent's retirement. To further simplify matters it is assumed that the child (of known ability) lives only a single working period and leaves neither heir, nor bequest.

In this context there are two motives for saving. First savings out of labour income are required to finance consumption during retirement. In the event of decease at the date of retirement, the parent's life-cycle saving is assumed to accrue to the child as a "windfall bequest."<sup>3</sup> Second, the parent may save an amount in excess of his planned retirement consumption, so as to leave a positive "planned" bequest to the child in the event that the parent survives to live out his retirement. It is assumed that the heir can borrow on the basis of the future receipt of a planned bequest, in order to finance current consumption.

The parent-donor is assumed to maximize the expected utility function:

$$U = U(c_{d1}) + \frac{p}{1+\delta} [U(c_{d2}) + \lambda U(c_h^b)] + \frac{1-p}{1+\delta} \lambda U(c_h^u) \quad U' > 0, U'' < 0 \quad (5)$$

where  $c_{d1}$  and  $c_{d2}$  represent the donor's consumption in periods one and two, respectively;  $\delta$  represents the rate of time preference and  $\lambda (\leq 1)$  measures the degree of parental altruism.  $b$  represents the present value of the planned bequest, discounted to the beginning of period two. As before, the planned bequest is constrained to be non-negative. The consumption of the next generation-heir may take on two values, depending on which state of the world occurs. If the parent dies at the end of retirement the child's lifetime income equals his own wage income plus the value of the planned bequest

(possibly zero) from the previous generation  $c_h^l = c_h^l = I_h + b$ . However, if the parent dies at the beginning of retirement the child receives both planned and windfall bequests, i.e.,  $c_h^u = c_h^u = I_h + b + c_{d2}$ .

For some purposes it will be useful to consider the special case in which the utility function (5) is the constant elasticity form:

$$\left. \begin{aligned} u(c_j) &= \frac{c_j^{1-\beta}}{1-\beta} & \beta \neq 1 \\ u(c_j) &= \log c_j & \beta = 1 \end{aligned} \right\} \beta \geq 0, \text{ all } j \quad (5)^1$$

where  $\beta$  is the constant relative risk aversion parameter  $\beta = -\frac{U''c_j}{U'}$ .

In general the parent maximizes the utility function (5) subject to the budget constraint:

$$I_d = c_{d1} + \frac{c_{d2} + b}{1+r} \quad (6)$$

The first order conditions are:

$$\frac{U'_{d1}}{pU'_{d2} + (1-p)U'_h{}^u} = \frac{1+r}{1+\delta} \quad (7a), \quad \frac{U'_{d1}}{\lambda[pU'_h{}^l + (1-p)U'_h{}^u]} \geq \frac{1+r}{1+\delta} \quad (7b)$$

or

$$\frac{U'_{d1}}{U'_{d2}} = \frac{p(1+r)}{(1-\phi)(1+\delta)} \quad (8a), \quad \frac{U'_{d1}}{U'_h{}^u} = \frac{\lambda(1-p)(1+r)}{\phi(1+\delta)} \quad (8b), \quad \frac{U'_{d1}}{U'_h{}^l} \geq \frac{\lambda p(1+r)}{(1-\phi)(1+\delta)} \quad (8c)$$

where  $\phi = \frac{(1-p)U'_h{}^u}{pU'_h{}^l + (1-p)U'_h{}^u}$  and  $U'_h{}^u = U'_h(c_h^u)$ ,  $U'_h{}^l = U'_h(c_h^l)$

If the optimum planned bequest is zero (i.e.,  $b^* = 0$ ) the inequalities in (7b) and (8c) apply, while if planned bequests are positive (7b) and (8c) hold as equalities. Stated differently, if the marginal utility of retirement consumption exceeds the marginal utility (to the donor) of the first dollar

transfer (i.e.,  $U'_{d2} > \lambda U'_h(I_h)$ ), which will necessarily occur if  $I_h > c_{d2}$ , the optimum planned bequest will be zero. Conversely, if the heir is sufficiently poor relative to the donor, planned bequests will be positive. In this case the level of planned bequests ( $b^*$ ) is determined by the equality of the marginal utility of retirement consumption with the marginal utility of the heir's consumption (i.e.,  $U'_{d2} = \lambda U'_h(I_h + b^*)$ ). If the donor discounts the utility of the heir (i.e.,  $\lambda < 1$ ) this implies that the retirement consumption of a surviving donor will exceed that of his heir, if planned bequests are positive. Since planned bequests redistribute income from those with high consumption to those with lower consumption, they unambiguously reduce the inequality in consumption in each period, as compared to the situation in which planned bequests are zero (Stiglitz 1978a).

Further, it can be seen from (7a) that, in the presence of uncertainty<sup>4</sup> (i.e.,  $0 < p < 1$ ) and altruism ( $\lambda > 0$ ), the life-cycle profile of the donor's consumption is dependent on the heir's income. In equation (8a) the marginal rate of substitution between parent's consumption in the two periods depends on the child's income via the term  $\phi$ . This interdependence between the generations is present both when the planned bequest is positive and when it is zero. I shall now examine these two cases in turn.

#### A. Zero Planned Bequests

##### (i) Changes in the Donor's Income

An increase in the donor's labour income leads to increased own consumption both during working life and retirement. If survival to the end of the retirement period was certain, the income elasticities of consumption in each period are independent of the degree of altruism, and depend on the rates of interest and time preference and the elasticity of the marginal utility of consumption ( $\beta$ ). If in the utility function (5) this latter elasticity is increasing, the income elasticity of saving will be less than (greater than) unity if the rate of interest exceeds (falls short of) the rate of time preference.

The presence of uncertainty (i.e.,  $p < 1$ ) leads an egoistic parent to discount consumption during uncertain retirement. Therefore unless the rate of interest is "large" relative to the rate of time preference, consumption during working life will exceed expected retirement consumption.<sup>5</sup> The income elasticity of saving is given by:

$$\eta_{c_{d2}I_d} = \frac{I_d}{c_{d2}} \frac{R_1}{\frac{R_1}{1+r} + R_2} \gtrless 1 \text{ as } R_1^* \gtrless R_2^* \quad (9)$$

where  $R_j = \left| \frac{U''(c_j)}{U'(c_j)} \right|$  is the absolute risk-aversion factor, and  $R_j^* = R_j c_j$

is the relative risk-aversion factor.

Since consumption during the working life is expected to exceed retirement consumption, the income elasticity of retirement consumption and hence of windfall bequests will exceed unity if relative risk aversion ( $R^*$ ) is increasing. Therefore when bequests arise as a byproduct of egoistic life-cycle savings, increasing relative risk aversion implies an income elasticity of bequests in excess of unity. Since this prediction is also generated by models of altruistic bequests under certainty (Becker 1974), empirical estimates of the income elasticity of bequests are not sufficient to distinguish the altruism model of inheritance from alternative models of egoistic accumulation in the face of uncertainty.

If the donor is altruistic (i.e.,  $\lambda > 0$ ) the expression for the income elasticity of retirement consumption is given by:

$$\eta_{c_{d2}I_d} = \frac{I_d}{c_{d2}} \frac{R_1}{\frac{R_1}{1+r} + (1-\phi)R_2 + \phi R_h} \gtrless 1 \text{ as } [(R_1^* - R_2^*) + \phi(R_2 - R_h)] \gtrless 0 \quad (10)$$

where  $R_h = R(I_h + c_{d2})$  and  $\phi$  has been previously defined. If  $r \leq \delta$ , consumption in the working period will exceed retirement consumption, and given increasing relative risk-aversion:  $R_1^* > R_2^*$ . In addition, since the consumption of the heir if the donor dies at retirement, exceeds the donor's expected retirement



consumption (i.e.,  $c_h^u = I_h + c_{d2} > c_{d2}$  if  $I_h > 0$ ), decreasing absolute risk-aversion implies  $R_2 > R_h$ . Therefore, for  $r \leq \delta$ , if the utility function is characterized by the Arrow (1971) properties of increasing relative- and decreasing absolute-risk aversion, retirement consumption and windfall bequests will be income elastic. Under these circumstances bequests are predicted to be income elastic both when parents are egoistic (i.e.,  $\lambda = 0$ ) and when they are altruists (i.e.,  $\lambda > 0$ ). Therefore, the introduction of altruism does not change the previous conclusion that the finding that bequests are income elastic implies nothing concerning the existence of an altruistic bequest motive. Therefore we must look elsewhere to develop tests for the presence of an altruistic bequest motive.

#### (ii) Changes in the Heir's Income

The effect of the recipient's income on the donor's consumption profile depends critically on the existence of both uncertainty and altruism. If either of these factors is missing, the donor's consumption is independent of the heir's income. The reason is clear. If the probability of survival is unity, the donor's retirement savings will never accrue to the heir as a windfall bequest and hence the heir's consumption is independent of the donor's saving. Second, if altruism is absent ( $\lambda = 0$ ), the additional consumption afforded the heir by a windfall bequest is not internalized by the donor, and hence again the heir's consumption is not a factor influencing the donor's life-cycle saving.

Under uncertainty with parental altruism, the expected utility from saving is the (probability weighted) sum of two components--the utility from additional retirement consumption if the donor survives and the utility from the additional consumption of heir if the donor dies at retirement.<sup>6</sup> Since greater labour income of the heir increases his consumption in the absence of a windfall bequest, with diminishing marginal utility, the return to saving is inversely related to the heir's income. An increase in the income

of the heir therefore results in the substitution of parental consumption during working life for consumption during retirement and results in a reduction in life-cycle saving. Thus in the presence of both uncertainty and altruism, when planned bequests are zero, life-cycle saving and windfall bequests are predicted to be inversely related to the income of the next generation. The life-cycle saving and therefore wealth, of individuals below the upper tail of the income distribution is therefore affected by the introduction of altruism--contrary to Flemming's contention (p. 19 quoted earlier). Since this inverse relationship does not occur when altruism is absent, empirical tests for the presence of the altruistic-motive for bequests can be performed on the basis of this prediction, given the maintained hypotheses of uncertain mortality and imperfect annuity markets.

In the absence of altruism, windfall bequests are predicted to be positively related to parental income and unrelated to the income of heirs (holding parental income constant). If there is less than complete regression to the mean, the labour incomes of parents and children will be positively related and thus inherited wealth and income will be positively correlated. By introducing a negative relationship between windfall bequests and the income of heirs, altruism reduces the correlation between inherited wealth and income and hence reduces the inequality in wealth associated with a given income distribution.

Once it is admitted that uncertainty and imperfect annuity markets may be significant characteristics of the real world, the importance of altruism as a determinant of life-cycle savings, inheritance and the distribution of wealth cannot be established on a priori grounds, and must be determined on the basis of empirical evidence. Flemming's conclusion that altruism is unimportant in explaining the bulk of the wealth distribution is therefore premature in the absence of empirical evidence. Neither does the observation that the majority of households receive no inheritance imply that the altruism

motive is unimportant. The model developed in this section implies that the possibility that retirement savings will accrue to the next generation may be an important determinant of life-cycle savings and therefore wealth--of households in which ex post the donor consumes his retirement savings and observed bequests are zero.

## B. Positive Planned Bequests

### (i) Changes in the Donor's Income

If the child's income is sufficiently low relative to parental income, planned bequests will be positive, and parental income will exceed lifetime consumption. In this case an increase in the donor's income leads to increased lifetime consumption and also a larger planned bequest. The income elasticities of donor consumption for families making planned bequests are expected to differ from those families with zero planned bequests. In particular it can be shown that in the absence of uncertainty, if the rate of interest equals the rate of time preference and if  $R^*$  is constant or increasing, then the income elasticity of donor consumption during the working period will exceed unity and that of retirement consumption is less than unity.<sup>7</sup> Thus, at least in this special case, the income elasticity of windfall bequests is lower for households making positive planned bequests than households making zero planned bequests. Moreover, under the same circumstances, the income elasticity of planned bequests exceeds unity.

More generally, it is shown in the Appendix that in the presence of uncertainty and given Arrow's propositions that  $R^*$  is increasing and  $R$  is decreasing, and with one mild additional restriction, the income elasticity of planned bequests will exceed unity.<sup>8</sup> Further if  $R^*$  is either constant or increasing, the income elasticity of planned bequests will exceed that of retirement consumption and windfall bequests. Therefore amongst families making positive planned bequests, windfall bequests will constitute a smaller

proportion of total bequests as income rises. On this basis we predict that for this group, the income elasticities of total (life-cycle and planned bequest) saving and total (planned and windfall) bequests will increase with income. A comparison of the income elasticities of the two regimes (zero and positive planned bequests) strengthens this result, since the income elasticities of total saving and total bequests are predicted to be greater when planned bequests are positive, than when they are zero.<sup>9</sup> Thus the income elasticities of saving and bequests may be larger for families in the upper tail of the income (or wealth) distributions, than for families located closer to the mean of these distributions. An important implication of the introduction of uncertainty and the distinction between planned bequests and windfall bequests is that, under plausible assumptions the income elasticity of bequests may be increasing. This contrasts with the altruism model under certainty in which the income elasticity of bequests is predicted to be declining (Adams, 1976, Becker-Tomes 1976).

(ii) Changes in the Heir's Income

The response of the donor's consumption to the heir's income, when planned bequests are positive, contrasts with the predicted response when planned bequests are zero. An increase in the income of the heir represents an increase in the total income of the two generation family. Since the donor's consumption in both periods is a superior good, his consumption in both periods will increase. However, since the donor's income is unchanged, planned bequests are reduced to "finance" the donor's increased consumption, partially offsetting the effect of the income increase on the heir's own consumption. Thus, when planned bequests are positive, the donor's consumption in both periods is positively related to the heir's income. This contrasts with the earlier result that when planned bequests are zero, the donor's retirement consumption is inversely related to the child's income. Given data on retirement consumption and the income of two generations, one could test for the presence of planned bequests on the basis of this prediction and

thus distinguish between these two categories of families without additional data on whether or not planned bequests are positive. Conversely, given additional data on whether or not families plan to bequeath material wealth to their children, one could test for the predicted differences in the income elasticities of savings and bequests and in the response of the donor's retirement consumption to the income of children, according to whether planned bequests are positive and zero.

Since windfall bequests increase, and planned bequests decrease, when the heir's income rises, it may appear at first sight that the relationship of total bequests to the recipient's income is ambiguous. However, since the reduction in planned bequests finances additional donor consumption both during working life and retirement, windfall bequests increase by less than the reduction in planned bequests. Total bequests are therefore predicted to be inversely related to the recipient's income. In both regimes under uncertainty, altruism implies that saving and total bequests are inversely related to the heir's income. When planned bequests are zero, this relationship results from the decreased retirement consumption and windfall bequests, that accompanies the increased income of the heir. When planned bequests are positive, the reduction in planned bequests offsets the increase in windfall bequests and results in the same inverse relationship between total bequests and the income of the recipient. Since in the absence of uncertainty and imperfect capital markets this inverse relationship would be restricted to families making positive planned bequests, the introduction of these factors extends the applicability of the altruistic model of bequests beyond the upper tail of the income and wealth distributions. Further, since the inverse relationship between total bequests and the recipient's income is predicted to be

stronger amongst households making positive planned bequests,<sup>9</sup> the finding of an inverse relationship for households where planned bequests are expected to be zero should represent particularly convincing evidence in favour of the altruism model of inherited material wealth.

#### IV. The Effects of Inheritance Taxation

The effects of interest and inheritance taxation on consumption, savings and bequests can be analyzed in the context of the model developed in the previous section. For simplicity attention is restricted to proportional taxes, and I shall only examine changes in the inheritance tax rate. Letting  $\tau$  represent the tax rate on inheritance, and  $t$  the tax rate on interest income, the budget constraint (6) becomes:

$$I_d = c_{d1} + \frac{c_{d2} + b^g}{[1+r(1-t)]} \quad (11)$$

where  $b^g$  is the gross planned bequest.

The heir's consumption in the two states of the world is given by:

$c_h = c_h^l = I_h + (1-\tau)b^g$ , if the donor lives to the end of the retirement period and  $c_h = c_h^u = I_h + (1-\tau)[c_{d2} + b^g]$ , if the donor dies at retirement.

The resulting first order conditions are similar to (7) and (8), except that  $\tilde{\lambda} = \lambda(1-\tau)$  replaces  $\lambda$  and  $\hat{r} = r(1-t)$  replaces  $r$ . Since planned bequests will be zero if  $U'_{d2} > \lambda(1-\tau)U'_h(I_h)$ , an increase in the inheritance tax ( $\tau$ ) is equivalent to a decrease in altruism ( $\lambda$ ), and hence the presence of an inheritance tax clearly reduces the incidence of planned bequests. I shall now examine the effects of changes in the inheritance tax rate ( $\tau$ ) in the two regimes.

### A. Zero Planned Bequests

In the absence of altruism, in which case planned bequests are always zero--the donor's retirement consumption and therefore (gross) windfall bequests is independent of the inheritance tax rate. For an egoistic donor the increased consumption afforded the heir by a windfall bequest following the donor's early decease does not enter the return to life-cycle saving. Hence the decreased net bequest resulting from the increased tax does not influence the return to saving, so that both saving and bequests are completely inelastic with respect to the inheritance tax, and therefore such taxes generate no dead weight losses. Under these circumstances an inheritance tax has no effect on the saving or risk-taking of the donor and hence is an attractive instrument for redistributive taxation.

However, in the presence of altruism, life-cycle consumption and saving will in general depend on the rate of inheritance taxation. The effect of the tax on retirement consumption is given by:

$$\frac{dc_{d2}}{d\tau} = \frac{-\phi[1-(1-\tau)R_h c_{d2}]}{(1-\tau) \left[ \frac{R_1}{1+r} + (1-\phi)R_2 + (1-\tau)\phi R_h \right]} \leq 0 \text{ as } (1+R_h I_h) \geq R_h^* \quad (12)$$

where  $R_h = R_h(c_h^u)$ ,  $R_h^* = R_h c_h^u$  are (respectively) the absolute and relative risk aversion factors, and  $c_h^u = I_h + c_{d2}(1-\tau)$ .

An increase in the inheritance tax has two effects. First, since the increment to the heir's windfall bequest that results from the last \$1 saved by the donor is decreased, the expected return to life-cycle saving falls, This causes the donor to substitute towards consumption during his working life, and reduces life-cycle saving and windfall bequests. However, there is also an "income" effect. Since the consumption of the heir which occurs if the donor dies at retirement is reduced, given diminishing marginal utility

the expected marginal utility from saving is increased. Put differently, in order to achieve a given level of the heir's consumption ( $c_h^u$ ), the donor has to increase retirement saving to offset the increased tax payment. Since the income and substitution effects operate in opposite directions the net effect is ambiguous a priori (cf. Bevan-Stiglitz 1978). However, it can be seen from (12) that if the relative risk aversion factor ( $R_h^*$ ) is not much greater than unity, i.e., the individual is not "strongly" risk averse, the substitution effect dominates. Indeed if  $R^*$  is constant the substitution effect will dominate if the marginal utility of consumption is not elastic (i.e.,  $\beta \leq 1$  in equation (5)<sup>1</sup>). In this case increased inheritance taxation leads to increased consumption during working life and reduced savings and bequests. Therefore even when planned bequests are zero, in the presence of altruism inheritance taxation leads to decreased saving and consequently gives rise to dead weight losses.<sup>10</sup> (Bevan-Stiglitz 1978)

#### B. Positive Planned Bequests

When planned bequests are positive, the effects of an increase in the inheritance tax may differ markedly from the case just discussed. The increased tax raises the marginal cost of increasing the heir's consumption via planned bequests-leading to a substitution effect towards the donor's own consumption. In addition, the return to saving for retirement is also diminished--although by less than the return to planned bequests, since in the latter case tax payment is certain, while retirement savings are subject to inheritance tax only if the donor dies at retirement. The donor therefore substitutes out of planned bequests into consumption in both periods and in addition, substitutes out of retirement consumption towards consumption in the first period. Clearly, even in the absence of income effects, the response of retirement consumption to the inheritance tax is ambiguous a priori. In order to



obtain analytical results we restrict our attention to the constant elasticity utility function in which  $\beta \leq 1$ --i.e., individuals are not "strongly" risk averse. In this case an increase in the inheritance tax will reduce planned bequests and increase the donor's consumption in both periods. Thus for  $\beta \leq 1$ , an increase in the inheritance tax raises retirement consumption and windfall bequests. This contrasts with the earlier result (also for  $\beta \leq 1$ ) that, when planned bequests are zero, retirement consumption and windfall bequests are negatively related to the inheritance tax rate. Since the donor's consumption increases with the tax rate, it follows that total savings, (for retirement consumption and planned bequests) and total bequests (expected windfall and planned bequests) are inversely related to the tax rate. Thus the increase in windfall bequests is more than offset by the reduction in planned bequests.

In both regimes if  $\beta \leq 1$  an increase in the inheritance tax rate will lead to reduced savings.<sup>11</sup> For policy purposes it is useful to compare the magnitude of the induced change in savings in the two regimes.<sup>12</sup> In the Appendix it is shown that the reduction in savings is likely to be greater when planned bequests are positive. Certainly this will be the case if  $\beta \leq 1$ . Since the supply of savings is predicted to be more elastic, when planned bequests are positive, this implies that the optimum tax structure should reflect this. Since positive planned bequests are likely to be associated with a large total bequest this implies that the optimum marginal tax rate on bequests from an efficiency point of view may be regressive over some range.

## V. Empirical Tests for the Presence of an Altruistic Bequest Motive

In the preceding sections it has been demonstrated that under uncertainty, the altruistic motive for bequests will influence the entire wealth distribution. Second, the existence of such a motive is of considerable importance in determining the optimum structure of inheritance tax rates. Empirical tests establishing the presence or absence of such a motive are therefore of some importance. In this section I present empirical results of such tests based upon the prediction that in the presence of altruism, the level of bequests will be inversely related to the heir's economic status. In the absence of altruism, parental bequests are unrelated to the recipient's economic status.

The data employed derive from a 5% random sample of 659 estates probated in the Cleveland, Ohio area in 1964-5 [Sussman, et. al., 1970]. Surviving kin and other heirs were interviewed, including 657 sons and daughters of the decedent. Information was obtained on the total estate, usual occupation, education and other characteristics of the deceased and on the inheritance, income, education and other characteristics of the surviving kin. The principal variables are briefly described here and defined, together with other variables, in Table 1. The means of variables for various subsamples are presented in Table A1 in the Appendix. It is important to note that unlike samples based on inheritance tax data, these decedents were not large wealth-leavers--the mean gross estate of decedents was \$12,000. Less than 5% of estates in this sample exceeded \$60,000 after deductions and were therefore liable to Federal Estate tax (Sussman et al. p. 188). Thus "windfall bequests" may be of considerable importance in this sample.

The inheritance received by the heir (INHR) (in \$000's) is the dependent variable in the following regressions. Since the dependent variable is truncated at \$250 it is necessary to employ the 'Tobit' technique or the

TABLE 1: DEFINITION OF VARIABLES

INHR	Inheritance received by son/daughter (\$000's) <sup>1</sup>
INCOMER	Annual family income of son/daughter (\$00's) <sup>2,4</sup>
INCOMED	Constructed measure of decedent's "permanent" annual income (\$00's) <sup>3</sup>
SCHD	Years of schooling of decedent
SCHD·SEXD	Interaction between SCHD and sex of decedent (female = 1, male = 0)
AGED	Age of decedent
RACED	Race of decedent (white = 2, nonwhite = 1)
SEXD	Sex of decedents (female = 2, male = 1)
MARRIEDD	1 if decedent married at date of death--left a surviving spouse, 0 otherwise
Religion Dummies	PROTD: 1 if decedent protestant, 0 otherwise, CATHD: 1 if decedent Catholic, 0 otherwise, JEWD: 1 if decedent Jewish, 0 otherwise. (Omitted category: No religion, Eastern Orthodox.)
Origin Dummies	ORIGINUS: 1 if decedent born in US, 0 otherwise, ORIGINWE: 1 if decedent born in Western Europe, 0 otherwise. (Omitted category: birthplace in Eastern Europe or elsewhere.)
TNKIN	The total number of kin of the decedent <sup>4</sup>
OTHERKIN	Number of kin of decedent, other than children
AGER	Age of son/daughter
SINGLER	1 if marital status of son/daughter single, 0 otherwise

Notes to TABLE 1

<sup>1</sup> Since the inheritance is coded in \$000's, the original code of 0 for an inheritance of less than \$500 was changed to \$250, the interval midpoint, following Brittain (1978), p. 42.

<sup>2</sup> The reported monthly family income, which was originally coded in categories, was recoded on an annual basis using interval midpoints for the closed intervals and using the estimated mean of a Pareto distribution for the open-ended interval.

<sup>3</sup> The measure of the decedent's "permanent" income was constructed using the following procedure: The income of recipients INCOMER (for those reporting a positive family income) was regressed on a set of "permanent" characteristics of recipients. The estimated coefficients were:

$$\begin{aligned} \log \text{INCOMER} = & 3.915 - 0.325 \text{ SCH} + 0.01 \text{ AGE} \cdot \text{SCH} - 0.104 \text{ AGE} + 0.0002 \text{ AGESQ} \\ & + 0.266 \text{ OCC} + 0.302 \text{ NEMPL} - 0.093 \text{ SEX} + 0.627 \text{ RACE} + 0.494 \text{ ORIGINWE} \\ & + 0.658 \text{ ORIGINUS} + 0.320 \text{ ORIGINEE} + 0.668 \text{ PROT} + 0.539 \text{ CATH} + 1.278 \text{ JEW} \\ R^2 = & 0.216 \quad n = 608 \end{aligned}$$

where AGESQ = Age squared, ORIGINEE = 1 if recipient's birthplace is Eastern Europe, 0 otherwise; OCC is a seven category occupation of "bread winner" code (coded from 1: unskilled, to 7 executive)\* NEMPL is number of family members employed.

These coefficients, together with the corresponding characteristics of the decedent were used to construct the income variable INCOMED. NEMPL was set equal to unity.

\* The results obtained using the predicted income of the decedent based upon an equation containing separate dummy variables for each occupational category do not differ significantly from those using a single occupational index.

<sup>4</sup> These variable were treated as endogenous and therefore the predicted values from a regression on the exogenous variables were introduced into the regressions. (See fn. 14 for the list of additional instruments.)

correction procedure proposed by Heckman (1979). The heir's income is measured by the Annual Family income of the son/daughter (in \$00's) --a measure derived from the heir's reported monthly family income.

No direct measure of the income of the decedent is available. The following procedure was therefore employed. The sample of sons and daughters was used to estimate an equation predicting the annual family income of recipients. The estimated coefficients and the corresponding permanent characteristics of the decedent were then used to predict the decedent's family income.<sup>13</sup> This constructed variable is taken as a measure of the decedent's permanent income.

In addition to the incomes of decedent and heir, other control variables were included in the regressions. The total number of kin and the marital status of the decedent hold constant the number of potential heirs across households. In addition the number of kin other than children (OTHERKIN) allows for the possibility that more distant relatives are treated differently than children in the inheritance process. The marital status of the recipient (SINGLER) allows for the possibility that married heirs may benefit from an inheritance received by their spouse. Finally age variables were included to allow for life cycle and cohort effects.

Before proceeding to the empirical results one final point should be made. In a lifetime context parents can be viewed as determining not only the amount of material wealth bequeathed to children, but also the share of family resources available to each child through their choice of family size. In addition a large body of literature in the human capital tradition (e.g., Parsons 1975) views parents as influencing the income of their children via decisions concerning their offspring's schooling. Hence in a wider context both the children's income and the number of children represent endogenous variables from the parents viewpoint (Tomes 1978). Therefore rather than introducing these variables directly into the regressions, an instrumental variables technique was employed.<sup>14</sup>

### Empirical Results

Table 2 reports regressions for the sample of 605 sons and daughters reporting non-zero family income. Lines 1 and 2 report Tobit regressions for alternative specifications of the dependent variable.<sup>15</sup> In line 1 the level of the heirs inheritance is the dependent variable. In this regression the decedent's income enters with a significant positive coefficient, while the recipient's income enters with a significant negative coefficient. This latter result is consistent with the existence of an altruistic motive for bequests.

The above result differs from the findings of Adams (1978) who uses the same data but finds little evidence of any relationship between the size of the inheritance and the recipient's characteristics. While the empirical model employed in Table 2 differs from that of Adams in a number of important respects,<sup>16</sup> the form of the dependent variable appears to be a decisive factor in explaining the disparity between my results and those of Adams. When the log of inherited wealth is used as the dependent variable in line 2, the heir's income ceases to be significant and takes on the "incorrect" sign. The choice between alternative functional forms depends critically on whether the errors in the inheritance equation are additive for proportional. A priori there appears little basis for preferring either specification.

Line 3 adds a little evidence on this question by reporting a probit regression on the probability of receiving an inheritance in excess of the limit value (\$250). This probability is unrelated to the decedent's income, but is significantly, inversely related to the recipient's income. Each 1% increase in the heir's income reduces the probability of receiving an inheritance in excess of \$250 by almost 7%.

TABLE 2: EMPIRICAL RESULTS: ALL SONS AND DAUGHTERS

Depdnt. Var.	Constant	INCOMED <sup>+</sup>	INCOMER <sup>+</sup>	AGED <sup>+</sup>	SCHD	SCHD.SEXD	TNKIN	OTHERKIN	SEXD	MARRIEDD	ORIGIN US	ORIGIN WE	PROTD	JEWD	RACE	SINGLER	AGER	L.R.
1. INHR	-14.651	3.703 <sup>*</sup> [4.396]	-3.520 <sup>*</sup> [2.237]	0.486 <sup>*</sup> [4.568]			-5.401 <sup>*</sup> [4.354]	2.208 [1.489]	6.235 <sup>*</sup> [3.234]	-10.624 <sup>*</sup> [5.145]	-6.795 <sup>*</sup> [2.878]	-3.183 [1.241]		9.399 <sup>*</sup> [2.403]		-5.743 <sup>**</sup> [1.911]		149.032
2. INHR <sup>+</sup>	-1.713	0.251 <sup>*</sup> [3.134]	0.057 [0.405]	0.032 <sup>*</sup> [2.351]			-0.275 <sup>*</sup> [3.473]		0.623 <sup>*</sup> [3.311]	-2.035 <sup>*</sup> [10.227]	-0.594 <sup>*</sup> [2.981]						0.015 [1.195]	240.810
3. pb(INHR >\$250)	-0.972	0.034 [0.292]	-0.067 <sup>*</sup> [1.960]	0.015 <sup>*</sup> [2.095]	0.101 <sup>**</sup> [1.650]	0.046 <sup>*</sup> [2.851]	-0.177 <sup>*</sup> [4.788]			-1.195 <sup>*</sup> [8.506]	-0.367 <sup>*</sup> [2.491]		-0.276 <sup>*</sup> [2.057]		0.677 <sup>**</sup> [1.794]			200.960

Notes: 1. n = 605 all regressions.

2. Regressions 1 and 2 are Tobit regressions. Number of limit observations = 251.

3. Regression 3 is a Probit regression. The dependent variable is the probability of receiving an inheritance in excess of \$250. In this regression INCOMER and TNKIN are actual values rather than instruments.

4. The absolute value of the asymptotic t-statistics is reported in parentheses beneath each coefficient (except the constant).

5. \* indicates coefficient significant at the 5% confidence interval  
\*\* 10% confidence interval.

6. + denotes variable entered in natural logarithm.

7. L.R. likelihood Ratio (distributed  $\chi^2$  with k - 1 degrees of freedom, where k is the number of regressors).

The results reported in Table 2 use the whole sample and thus the dependent variable includes both planned bequests and windfall bequests. In an effort to separate this latter component a subsample was selected of heirs, whose predicted income at age 55 exceeded the predicted income of the decedent at age 55. For this subsample "windfall bequests" should be more important than for the sample as a whole. Given the secular growth of real income, not surprisingly 80% of heirs fall in this category and 61% of these received a bequest exceeding \$250.

Table 3 reports regressions for this subsample. The Tobit results (lines 1 and 2) largely duplicate those for the whole sample. For both specifications the decedent's income is positive and significant. However the recipient's income enters with a significant negative coefficient only when the level of inheritance is the dependent variable (line 1). The recipient's income is not significant when the log of inherited wealth is used as the dependent variable (line 2). However these results may be biased due to sample selection.

In order to correct for sample selection bias the procedure developed by Heckman (1976, 1979) and extended to the case of two-selection rules by Catsiapis and Robinson (1978) was implemented. In the application considered here the two selection rules are (i) the "desired" bequest is only observed if it exceeds \$250 and (ii) the sample selection rule that the heir's income at age 55 exceeds that of the donor at the same point in the life-cycle. Following Heckman's (1979) procedure two probit regressions were estimated<sup>17</sup> and used to calculate the "omitted variables":  $\hat{\lambda}_1$  and  $\hat{\lambda}_2$  respectively, which are then included in the subsequent OLS regression on the selected sample (see Heckman 1979).



TABLE 3: EMPIRICAL RESULTS: SONS AND DAUGHTERS WITH INCOME EXCEEDING THAT OF PARENT

a. Tobit Regressions (n = 489)													L.R.		
Depdt. Var.	Constant	INCOMED <sup>+</sup>	INCOMER <sup>+</sup>	AGED	SCHD	TNKIN	OTHERKIN	SEXD	MARRIEDD	ORIGIN US	ORIGIN WE	SINGLER			
1. INHR	-22.652	7.771 *	-3.434 *	0.372 *	-1.328 **	-2.577 *		8.006 *	-9.770 *	-4.346 *	-4.520 *		133.326		
		[4.662]	[2.263]	[3.719]	[1.668]	[3.123]		[4.046]	[5.697]	[2.135]	[2.008]				
2. + INHR	-2.040	0.317 *	-0.041	0.018 *	0.050	-0.154 *		0.661 *	-1.903 *	-0.526 *	-0.410 *		432.658		
		[2.597]	[0.388]	[2.477]	[0.880]	[2.765]		[4.497]	[14.932]	[3.524]	[2.541]				
b. OLS Regressions (n = 300)															
3. INHR	-4.425	8.523 *	-3.848 *	0.429 *	-2.429 *	-4.702 *	2.944 *	5.117 *				-5.361 **	$\hat{\lambda}_1$ -6.010 *	$\hat{\lambda}_2$ -3.282	0.268
		[4.865]	[2.700]	[4.165]	[2.763]	[3.873]	[2.005]	[2.510]				[1.709]	[2.569]	[0.658]	
4. + INHR	0.210	0.328 *	-0.172 **	0.024 *		-0.268 *	0.185 *	0.069	-0.671 *				-0.281	-0.402	0.329
		[4.260]	[1.842]	[3.634]		[3.617]	[1.968]	[0.581]	[3.332]				[1.176]	[1.347]	

Notes: 1. Regressions 1 and 2 are Tobit regressions, n of limit observations = 189, asymptotic t-statistics are reported in parentheses.

2. Lines 3 and 4 report OLS regressions on the 300 non-limit observations,  $\hat{\lambda}_1$  and  $\hat{\lambda}_2$  are constructed variables from probit regressions (see text). t-statistics reported in parentheses have been corrected for the heteroscedasticity introduced by sample selection (see Heckman 1976).

3. See notes 5-7 Table 2.

The lower half of Table 3 reports these OLS results for the 300 heirs who received an inheritance in excess of \$250 and whose "peak" income (at 55) exceeded that of the decedent. In line 3 the dependent variable is the level of inherited wealth. In this regression the decedent's income enters with a significant positive coefficient, while that of the recipient is negative and significant. When the log of inherited wealth is used as the dependent variable (in line 4) the donor's income is again positive and significant.<sup>18</sup> The heir's income is negative and just fails to attain significance at conventional levels--being significantly different from zero at the 6.5% level. Thus for this subsample, for whom planned bequests are expected to be relatively unimportant, there is considerable evidence of an altruistic motive influencing the level of bequests. The negative relationship between the heir's income and the level of inherited wealth, predicted by the altruism model, is observed when either the level or log of inherited wealth is used as the dependent variable.

The behavior of the computed " $\hat{\lambda}$ " variables in these regressions deserves comment. The  $\hat{\lambda}_1$  variable, which relates to the probability of observing the limit value for the inheritance of \$250, is significant in line 3, but not in line 4. The reason for this result appears to be that when the log of inherited wealth is the dependent variable, the marital status of the decedent (MARRIEDD) picks up the effects of sample selection. Conversely, when the dependent variable is the level of inherited wealth, the sample selection variable  $\hat{\lambda}_1$  is significant, while the donor's marital status is never significant--a result that contrasts with the earlier Tobit regressions. (See Table 3, line 1). The second sample selection variable:  $\hat{\lambda}_2$ , relating to the probability of the heir's income exceeding that of the donor, is not significant in either regression.

## VI. Summary and Conclusions

This paper has re-examined the conclusion reached by Flemming that an altruistic motive for bequests is unlikely to influence the wealth distribution except in the upper tail. It has been shown that while this conclusion is valid under certainty or in the presence of perfect annuity markets, this result does not extend to the situation of uncertainty. Contrary to Flemming, when the length of life is uncertain and annuity markets do not exist, the altruistic bequest motive is predicted to influence the entire wealth distribution.

On a positive note, this paper has sought to derive testable implications which distinguish between the presence and absence of an altruistic bequest motive. It has been demonstrated that estimates of the income elasticity of bequests do not provide such a test. However, in the presence of parental altruism the bequest received by an heir is predicted to be inversely related to the heir's income in the absence of the bequest. In the absence of altruism, if life-cycle saving results entirely from the egoistic desire to avoid the contingency of exhausting wealth prior to decease, no such relationship should exist.

This prediction was subjected to empirical test using data on a sample of estates consisting mainly of small wealth-leavers. While the empirical results depend to some extent on the functional form that is estimated, there is evidence of an inverse relationship between the bequest received and the heir's family income. This inverse relationship is particularly striking in a subsample of heirs with a "peak" income in excess of their parents'. These empirical results lend support to the view expressed in this paper that the altruism model of bequests is applicable beyond the minority of families in the upper tail of the income distribution.

### Footnotes

<sup>1</sup>In the terminology of Michael (1972) let  $x_d$  and  $x_h$  be the market purchased goods used in the "home production" of utility-yielding commodities  $c_d$  and  $c_h$ , respectively. The home production functions for each generation are  $c_d = x_d$  and  $c_h = (1+\mu)x_h$ . The budget constraints (2) and (3) should then be modified by substituting  $x_d$  for  $c_d$  and  $x_h$  for  $c_h$ .

<sup>2</sup>The condition (4) assumes that parameter values are "small", so that  $\ln(1+x) \approx x$ . Obviously the parameter values over a 25 year interval are not "small". However the quantitative results concerning the incidence of altruism are unlikely to be significantly altered by the use of more exact approximations.

<sup>3</sup>This assumption is consistent with the law of intestate succession in the U.S., UK and Canada (See for example Wypyski (1976) for the US statutes). In the absence of distant relatives the property of an intestate decedent escheats to the state. In Sussman's random sample of Ohio estates 5.6% of intestate estates (1.2% of all estates) had no known surviving next of kin [Sussman et al. 1970, pp. 142-3].

<sup>4</sup>Throughout the remainder of this paper I use the term uncertainty to refer to the existence of uncertain mortality and the absence of annuity markets.

<sup>5</sup>Discounting occurs because of the absence of perfect annuity/insurance markets. Barro and Friedman (1977) show that when such perfect capital markets exist and both income and consumption are uncertain, uncertainty does not lead to the discounting of future consumption.

In the absence of altruism (8a) becomes

$$\frac{U'_{d1}}{U'_{d2}} = \frac{p(1+r)}{1+\delta}$$

This implies  $c_{d1} > c_{d2}$  if  $(1+\delta)(1-p)/p > r-\delta$ . I assume this condition is fulfilled.

<sup>6</sup>Flemming's conclusion that altruism is unimportant as a determinant of life-cycle saving and the wealth distribution (except for the top tail of the distribution) is based upon a mechanistic model in which total saving is the sum of saving for various motives. However, just as the demand for money is not the sum of demands derived from transactions, precautionary and speculative motives, so savings motives will not in general be additive. Saving motives are not "additive" in the context of the utility maximizing model developed in this section.

<sup>7</sup>See Appendix. I assume throughout the remainder of this section that  $r \leq \delta$ . The relevance of this case is increased if there is a (proportional) tax on interest income, since  $r$  then represents the net of tax rate of interest. (See Section IV).

<sup>8</sup>The additional restriction is that the elasticity of relative risk aversion

$$\left( \frac{\partial R^*}{\partial c} \frac{c}{R^*} \right) = \eta^* < \frac{1}{2}$$

That is if relative risk aversion is not increasing

"too rapidly"--this is a sufficient condition for the income elasticity of planned bequests to exceed unity. See Appendix.

<sup>9</sup>This comparison evaluates the income elasticities in the limit as  $b^* \rightarrow 0$ . The statement in the text is therefore true for "small  $b^*$ " and need not be true in general.

<sup>10</sup>Although the effects on the capital stock can be offset, for example by monetary policy (Stiglitz 1978a), the deadweight losses remain.

<sup>11</sup>This result contrasts with that of Blinder (1974 p. 36 proposition 2.4) where the effect of an inheritance tax on saving depends on  $\beta \geq 1$ . In the present model in which the heirs consumption exceeds inherited wealth, due to other sources of wealth, it is more likely that an inheritance tax leads to a reduction in savings.

<sup>12</sup>See footnote 9 above.

<sup>13</sup>If the structural coefficients of the prediction equation are constant over time, this procedure gives consistent estimates of the decedent's income in 1965 dollars.

<sup>14</sup>Instruments, in addition to the exogenous variables defined in Table 1, were the sex of recipient, a dummy variable indicating the presence of non-labour income, a dummy variable indicating if the child was divorced or separated, quadratic terms in the ages of recipient and donor and an interaction term between the age and education of the donor.

Since holding OTHERKIN constant, variations in TNKIN reflect differences in the family size of the decedent, this variable is treated as endogenous.

<sup>15</sup>Preliminary regressions also regressed the log of inheritance on the level of both income variables. In this specification neither income variable was significant.

In addition the empirical results obtained using the level of inheritance (INHR) as the dependent variable are insensitive to whether the limit value is coded as \$250 or \$0 (See note 1 to Table 1).

<sup>16</sup> A crucial difference between the empirical strategy followed here and that of Adams is in the choice of a measure of parental income. Adams uses the mean family income of the heirs as a measure of parental income and uses child's education as a measure of the heirs own economic status.

<sup>17</sup> The exogenous variables and various interaction terms between them were entered in the probit regressions.

<sup>18</sup> In both specifications (lines 3 and 4) the excluded variables were insignificant at the 10% level in preliminary regressions.

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TABLE A1: MEANS OF VARIABLES FOR VARIOUS SUBSAMPLES

Variable	I All sons/daughters reporting positive family income n = 605	II Sons and daughters in sample I with pred- icted income at age 55 exceeding that of parent at age 55 n = 489	III Sons and daughters in sample II receiving an inheritance in excess of the limit value of \$250 n = 300
INHR (\$000's)	4.257	4.213	6.665
INCOMER (\$00's)	115.178	118.767	124.836
INCOMED (\$00's)	60.847	37.540	36.672
SCHD	9.102	8.180	8.304
AGED	70.630	72.129	72.975
SEXD (% female)	41.65	46.83	56.64
MARRIEDD (%)	58.84	52.76	35.27
TNKIN	4.134	4.055	3.990
OTHERKIN	1.020	0.873	0.677
AGER	42.828	44.352	45.379
SINGLER (%)	9.59	7.77	7.96

Appendix

This appendix presents expressions for the elasticities of consumption and bequests with respect to the incomes of the two generations and the inheritance tax rate ( $\tau$ ).

1. Zero Planned Bequests

$$\eta_{1I_d} = \frac{I_d}{c_{d1}} \cdot \frac{(1-\phi)R_2 + \phi R_h}{\Lambda} \quad (A1)$$

where  $\eta_{1I_d}$  is the elasticity of parental consumption in period 1 with respect to parental income,  $R_j$  are the absolute risk aversion factors (e.g.,  $R_h = R_h(c_h^u)$  and  $R_h^* = R_h c_h$  represents the relative risk aversion factor),  $\phi$  is defined in the text and  $\Lambda = \frac{1}{1+r} + (1-\phi)R_2 + \phi R_h$ . This elasticity is less than unity if  $r \leq \delta$ ,  $I_h > 0$  and the utility function is characterized by decreasing absolute- and increasing relative-risk aversion.

$$\eta_{2I_d} = \frac{I_d}{c_{d2}} \cdot \frac{R_1}{\Lambda} \quad (A2)$$

(A2) is the elasticity of retirement consumption (windfall bequests) with respect to parental income. Thus elasticity exceed unity under the conditions stated above.

$$\eta_{1I_h} = \frac{I_h}{c_{d1}(1+r)} \cdot \frac{\phi R_h}{\Lambda} > 0 \quad (A3)$$

$$\eta_{2I_h} = - \frac{I_h}{c_{d2}} \cdot \frac{\phi R_h}{\Lambda} < 0 \quad (A4)$$

(A3) and (A4) are (respectively) the elasticities of period 1 consumption and windfall bequests with respect to the heir's income.

B. Positive Planned Bequests

$$\eta_{1I_d} = \frac{I_d}{c_{d1}} \frac{\phi R_h^u [R_2 + R_h^l] + (1-\phi) R_2 R_h^l}{\psi} \quad (A5)$$

where  $\psi = [\frac{R_1}{1+r} + \phi R_h^u] [R_2 + R_h^l] + (1-\phi) R_2 R_h^l$ ,  $R_h^u = R_h(c_h^u)$ ,  $R_h^l = R_h(c_h^l)$

$$\eta_{2I_d} = \frac{I_d}{c_{d2}} \cdot \frac{R_1 R_h^l}{\psi} \quad (A6)$$

$$\eta_{bI_d} = \frac{I_d}{b} \frac{R_1 R_2}{\psi} \quad (A7)$$

(A7) is the elasticity of planned bequests with respect to parental income. Sufficient conditions for this elasticity to exceed unity are that absolute risk aversion is decreasing, relative risk aversion is increasing and:

$$\eta_R \geq \frac{1}{2} > \frac{R_h^l c_h^l}{R_2 c_{d2} + R_h^l c_{d2}} \quad \text{where } \eta_R = \left| \frac{\partial R_i}{\partial c_j} \frac{c_j}{R_j} \right| \text{ is the elasticity of absolute}$$

risk aversion. If this parameter is constant  $\eta_{R^*} + \eta_R = 1$ , where  $\eta_{R^*}$  is the elasticity of relative risk aversion. Hence  $\eta_R \geq \frac{1}{2}$  implies  $\eta_{R^*} \leq \frac{1}{2}$ . This last condition is therefore that relative risk aversion is not increasing "too" rapidly.

Comparing the elasticities (A7) and (A6):

$$\text{sgn}[\eta_{bI_d} - \eta_{2I_d}] = \text{sgn}[R_2 c_{d2} - R_h^l b] = \text{sgn}[R_2^* - R_h^{l*} + R_h^l I_h] \quad (A8)$$

This expression is positive if relative risk aversion ( $R^*$ ) is either constant or increasing and  $\lambda < 1$  since it is shown in the text that  $c_{d2} > c_h^l = I_h + b$ . In this case the income elasticity of planned bequests exceeds that of windfall bequests.

The response of saving and bequests to parental income in the two regimes (zero and positive planned bequests) can be compared at the point where the donor is indifferent between making zero and a small positive bequest (i.e.,  $U'_{d2} = U'^{\ell}_h(I_h)$  and  $b^* = 0$ ).

$$\text{Defining total savings } s^T = \frac{b + c_{d2}}{1+r} = I_d - c_{d1}$$

$$\text{sgn}\left[\frac{ds^T}{dI_d}(b^* > 0) - \frac{ds^T}{dI_d}(b^* = 0)\right] = \text{sgn}(1 - \phi)R_2 > 0 \quad (\text{A9})$$

where  $\frac{ds^T}{dI_d}(b^* > 0)$  is evaluated in the limit as  $b^* \rightarrow 0$ .

From (A9) the response of saving to parental income is greater when planned bequests are positive than when they are zero, in the neighbourhood of the point of comparison. Defining expected total bequests as  $b^T = b + (1-p)c_{d2}$  a similar result can be obtained.

The elasticities of consumption and bequests with respect to the heir's income in the regime in which planned bequests are positive are

$$\eta_{I_h} = \frac{I_h}{c_{d1}(1+r)} \cdot \frac{\phi R_h^u[R_2 + R_h^{\ell}] + (1-\phi)R_2 R_h^{\ell}}{\psi} \quad (\text{A10})$$

$$\eta_{2I_h} = \frac{I_h}{c_{d2}} \frac{R_h^{\ell} R_1 / (1+r)}{\psi} > 0 \quad (\text{A11})$$

$$\eta_{bI_h} = \frac{-I_h}{b} \frac{\phi R_h^u[R_2 + R_h^{\ell}] + (1-\phi)R_2 R_h^{\ell} + R_h^{\ell} R_1 / (1+r)}{\psi} < 0 \quad (\text{A12})$$

### C. Inheritance Taxation

The response of windfall bequests to the inheritance tax rate ( $\tau$ ) when planned bequests are zero is given in the text (equation (12)). The effect is in general ambiguous in sign, being negative if the relative risk aversion factor ( $R^*=\beta$ ) is less than (or equal to) unity.

When planned bequests are positive the response of consumption and bequests to the inheritance tax rate are given by the expressions:

$$\frac{dc_{d1}}{d\tau} = \frac{(1-\phi)R_2[1-(1-\tau)R_h^L b^G] + \phi[R_2+(1-\tau)R_h^L][1-(1-\tau)R_h^U(c_{d2}+b^G)]}{(1-\tau)(1+f)\Omega} \quad (A13)$$

$$\text{where } \Omega = \left[ \frac{R_1}{1+f} + (1-\tau)\phi R_h^U \right] [R_2+(1-\tau)R_h^L] + (1-\phi)R_2(1-\tau)R_h^L$$

This expression is positive if the relative risk aversion factor is less than (or equal to) unity, assuming  $I_h > 0$ .

$$\frac{dc_{d2}}{d\tau} = \frac{\left[ \frac{R_1}{1+f} + (1-\tau)\phi R_h^U \right] [1-(1-\tau)R_h^L b^G] - (1-\tau)\phi R_h^L [1 - (1-\tau)R_h^U \cdot (c_{d2}+b^G)]}{(1-\tau)\Omega} \quad (A14)$$

When the relative risk aversion factor is less than (or equal to) unity, this expression remains ambiguous in sign reflecting the opposing effects of substitution between consumption in periods 1 and 2 and between planned and windfall bequests.

$$\frac{db^G}{d\tau} = \frac{\left\{ \left[ \frac{R_1}{1+f} + (1-\tau)\phi R_h^U + (1-\phi)R_2 \right] [1-(1-\tau)R_h^L b^G] + \phi R_2 [1-(1-\tau)R_h^U \cdot (c_{d2}+b^G)] \right\}}{(1-\tau)\Omega} \quad (A15)$$

If the relative risk aversion factor is less than (or equal to) unity, this expression is negative, assuming  $I_h > 0$ .

The response of saving to the inheritance tax rate in the two regimes (zero and positive planned bequests) can be compared at the margin when the

donor-parent is indifferent between making zero planned bequests and making a small positive planned bequest (i.e.,  $U'_{d2} = \tilde{U}'_h(I_h)$  and  $b^{g*} = 0$ ). Defining total saving as  $S^T = I_d - c_{d1}$

$$\text{sgn} \left\{ \frac{dS^T}{d\tau}(b^{g*} > 0) - \frac{dS^T}{d\tau}(b^{g*} = 0) \right\} = \text{sgn} - \left\{ R_2 + (1-\tau) \phi^u_h [1 - R_2^*] + \frac{R_1}{1+\tau} \right\} \quad (\text{A16})$$

where  $R_2^* = R_2 c_{d2}$  is the relative risk aversion factor and  $\frac{dS^T}{d\tau}(b^{g*} > 0)$  is evaluated in the limit as  $b^{g*} \rightarrow 0$ . A sufficient condition for this expression to be negative is  $R_2^* \leq 1$  i.e., the relative risk aversion factor not exceed unity. If this condition is fulfilled an increase in the inheritance tax rate results in a greater decrease in savings when planned bequests are positive, than when they are zero--in the neighbourhood of the point of comparison.